

What is claimed is:

- Suh A17*
1. A process for producing a rigid reticulated article, comprising:
    - (a) providing a first dispersion of a ceramic or metal powder, a binder, and a solvent;
    - (b) providing a reticulated substrate which has open, interconnected porosity.
    - (c) contacting the reticulated substrate with the first dispersion to coat the substrate with the dispersion to form a first coating;
    - (d) drying the coated reticulated substrate;
    - (e) contacting the reticulated substrate with one or more additional dispersions to form one or more additional coatings wherein the composition of the one or more additional coatings are the same or different from each other and the first coating;
    - (f) drying the additional coating between the steps of contacting;
    - (g) heating the coated reticulated substrate at a time and temperature sufficient to pyrolyze any organic components; and
    - (h) sintering to form a ceramic or metal or composite reticulated article.
  2. A process according to claim 1, wherein after drying the first coating and the one or more coatings form an insoluble, flexible film which can be subsequently deformed without substantially cracking off, flaking off or peeling off of the substrate.
  3. A process according to claim 1, wherein the substrate is compliant.
  4. A process according to claim 1, wherein the substrate is wettable.
  5. A process according to claim 1, wherein the pores of the rigid reticulated article are substantially fully open and interconnected.
  - Suh A18* 6. A process according to claim 1, wherein up to 6 additional coatings are provided.

7. A process according to claim 6, wherein a successive dispersion has a lower viscosity than a preceding dispersion.

8. A process according to claim 6, wherein a successive dispersion has the same viscosity as a preceding dispersion.

9. A process according to claim 7, wherein each dispersion has a lower viscosity than the preceding dispersion.

10. A process according to claim 6, wherein the viscosity of the first dispersion is from 200-2500 cP.

11. A process according to claim 6, wherein the viscosity of the first dispersion is from 200-2500 cP, the viscosity of the dispersion of the first additional coating is from 100-1500 cP, the viscosity of the dispersion of the second additional coating is from 50-800, and the viscosity of the dispersion of the third additional coating is 200 cP or less.

12. A process according to claim 6, wherein at least two additional coatings are provided and the composition of the first coating is different than the composition of the final coating and one or more intermediate coatings has a composition which is a composite of the first and final coating to form a gradient coating.

13. A process according to claim 12, wherein the first coating comprises zirconia, the final coating comprises hydroxyapatite calcium phosphate ceramic, and an intermediate coating comprises a combination of zirconia and hydroxyapatite calcium phosphate ceramic.

14. A process according to claim 1, wherein the reticulated substrate is a compliant polymeric foam.

15. A process according to claim 14, wherein the foam has at least 20 pores per inch.

16. A process according to claim 14, wherein the foam has at least 100 pores per inch.

17. A process according to claim 1, wherein excess dispersion is removed from the reticulated substrate by squeezing and/or compressed air.

18. A process according to claim 1, wherein the binder becomes solvent-insoluble and is compliant upon drying.

19. A process according to claim 18, wherein the binder is a polyacrylate emulsion which polymerizes upon drying.

20. A process according to claim 19, wherein the binder is present in the dispersion in an amount of at least 25% by volume.

21. A process for producing a rigid reticulated article, comprising:

- (a) providing a first dispersion of a metal or ceramic powder, a binder which becomes solvent-insoluble and flexible upon drying, and a solvent;
- (b) providing a reticulated substrate which has open, interconnected porosity;
- (c) contacting the reticulated substrate with the first dispersion to coat the substrate with the dispersion;
- (d) drying the coated reticulated substrate;
- (e) optionally contacting the reticulated substrate with one or more additional dispersion to form one or more additional coatings wherein the one or more additional coatings are the same or different from each other and the first coating;
- (f) drying the additional coating between the steps of contacting;

(g) heating the coated reticulated substrate at a time and temperature sufficient to pyrolyze any organic components; and

(h) sintering to form a ceramic or metal or composite reticulated article.

22. A process according to claim 21, wherein the binder is a polyacrylate emulsion which polymerizes upon drying.

23. A process according to claim 21, wherein the binder is present in the dispersion in an amount of at least 25% by volume.

Sub  
A20> 24. A process according to claim 21, wherein the binder is present in the dispersion in an amount of at least 50% by volume.

25. A process according to claim 21, wherein after drying the first coating and the optional one or more coatings form an insoluble flexible film which can be subsequently deformed without substantially cracking off, flaking off or peeling off of the substrate.

26. A process according to claim 21, wherein the substrate is compliant.

27. Method of forming a ceramic article useful as a bone substitute and having an outer surface defining a shape having a bulk volume and having open, interconnecting openings extending throughout said volume and opening through said surface, the method comprising providing an organic open-pore structure, coating surfaces of pores of the structure with a ceramic slip, pyrolyzing the organic structure to leave a ceramic structure having struts defining a plurality of interconnecting interstices, and providing within said interstices an porous osteoconductive composition exposed to said interconnecting openings.

28. A method of claim 27 including the step of sintering the ceramic structure.

29. A method of claim 28 wherein said sintering step is performed before said osteoconductive composition is provided in said interconnecting interstices.

30. A method of claim 28 wherein said sintering step is performed after said osteoconductive composition is provided in said interconnecting interstices.

31. A method of claim 28 including the step of shaping said organic open-pore structure to a predetermined configuration before coating the pores thereof with said ceramic slip.

32. A method of claim 28 including the step of shaping said organic open-pore structure to a predetermined configuration after coating the pores thereof with said ceramic slip.

33. Method of forming a ceramic article useful as a bone substitute and having an outer surface defining a shape having a bulk volume and having open, interconnecting openings extending throughout said volume and opening through said surface, the method comprising providing an organic open-pore structure, coating surfaces of pores of the structure with a ceramic slip comprising a strong, supportive ceramic material and a separate osteoconductive material, pyrolyzing the organic structure to leave a ceramic structure having struts defining a plurality of interconnecting interstices, and sintering the ceramic structure, said osteoconductive material being exposed to said interconnecting openings.

34. A method of claim 33 including the step of inserting a calcium phosphate bone cement into said openings.

35. A method of claim 1, further comprising the step of adding fibers and/or whiskers to at least one of the first dispersion and the one or more additional dispersions.

36. A method of claim 21, further comprising the step of adding fibers and/or whiskers to at least one of the first dispersion and the one or more additional dispersions.

37. A rigid reticulated article, comprising, a first sintered ceramic or metal or composite material having an outer surface defining a shape having a bulk volume, interconnecting openings extending throughout said volume and opening through said surface,

Sub  
A217

and struts bounding said interconnecting openings, wherein said material has at least 20 openings per inch.

38. A rigid reticulated article according to claim 37, further comprising a second sintered ceramic or metal or composite material in contact with the first sintered material, wherein the second sintered material can be the same or different than the first sintered material.

39. A rigid reticulated article according to claim 37, wherein said interconnecting openings have a 3-3 connectivity.

40. A rigid reticulated article according to claim 38, wherein said article is formed by a process comprising:

- (a) providing a first dispersion of a ceramic or metal powder, a binder, and a solvent;
- (b) providing a reticulated substrate which has open, interconnected porosity.
- (c) contacting the reticulated substrate with the first dispersion to coat the substrate with the dispersion to form a first coating;
- (d) drying the coated reticulated substrate;
- (e) contacting the reticulated substrate with one or more additional dispersions to form one or more additional coatings wherein the composition of the one or more additional coatings are the same or different from each other and the first coating;
- (f) drying the additional coating between the steps of contacting;
- (g) heating the coated reticulated substrate at a time and temperature sufficient to pyrolyze any organic components; and
- (h) sintering to form a ceramic or metal or composite reticulated article.

41. A rigid reticulated article according to claim 37, wherein said article is formed by a process comprising:

- (a) providing a first dispersion of a metal or ceramic powder, a binder which becomes solvent-insoluble and flexible upon drying, and a solvent;
- (b) providing a reticulated substrate which has open, interconnected porosity;
- (c) contacting the reticulated substrate with the first dispersion to coat the substrate with the dispersion;
- (d) drying the coated reticulated substrate;
- (e) optionally contacting the reticulated substrate with one or more additional dispersion to form one or more additional coatings wherein the one or more additional coatings are the same or different from each other and the first coating;
- (f) drying the additional coating between the steps of contacting;
- (g) heating the coated reticulated substrate at a time and temperature sufficient to pyrolyze any organic components; and
- (h) sintering to form a ceramic or metal or composite reticulated article.

Add a23